



## Complete Summary

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### GUIDELINE TITLE

Evidence-based care guideline for medical management of first urinary tract infection in children 12 years of age or less.

### BIBLIOGRAPHIC SOURCE(S)

Cincinnati Children's Hospital Medical Center. Evidence-based care guideline for medical management of first urinary tract infection in children 12 years of age or less. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2006 Nov. 23 p. [70 references]

### GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Cincinnati Children's Hospital Medical Center. Evidence based clinical practice guideline for medical management of first time acute urinary tract infection in children 12 years of age or less. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2005 Apr 18. 20 p.

### \*\* REGULATORY ALERT \*\*

### FDA WARNING/REGULATORY ALERT

**Note from the National Guideline Clearinghouse (NGC):** This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- [July 08, 2008, Fluoroquinolones \(ciprofloxacin, norfloxacin, ofloxacin, levofloxacin, moxifloxacin, gemifloxacin\)](#): A BOXED WARNING and Medication Guide are to be added to the prescribing information to strengthen existing warnings about the increased risk of developing tendinitis and tendon rupture in patients taking fluoroquinolones for systemic use.
- [September 11, 2007, Rocephin \(ceftriaxone sodium\)](#): Roche informed healthcare professionals about revisions made to the prescribing information for Rocephin to clarify the potential risk associated with concomitant use of Rocephin with calcium or calcium-containing solutions or products.

### COMPLETE SUMMARY CONTENT

\*\* REGULATORY ALERT \*\*

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## SCOPE

### **DISEASE/CONDITION(S)**

Urinary tract infection (UTI)

### **GUIDELINE CATEGORY**

Diagnosis  
Evaluation  
Management  
Treatment

### **CLINICAL SPECIALTY**

Family Practice  
Infectious Diseases  
Nephrology  
Pediatrics  
Radiology  
Urology

### **INTENDED USERS**

Advanced Practice Nurses  
Allied Health Personnel  
Health Care Providers  
Nurses  
Patients  
Physician Assistants  
Physicians

### **GUIDELINE OBJECTIVE(S)**

- To improve the use of appropriate diagnostic criteria
- To improve the use of appropriate antibiotic therapy
- To improve the use of appropriate imaging studies
- To avoid long-term medical problems
- To improve parental involvement in decision-making around the management of urinary tract infections
- To identify the infants and children at most risk for long-term renal damage

## TARGET POPULATION

Children 12 years of age or less, with a first presumed or definite episode of urinary tract infection (UTI)

These guidelines are not intended for use in children:

- With known immunodeficiencies
- With known major genitourinary anomalies
- With sepsis with shock or meningitis
- Needing ventilator or other intensive care
- With other severe comorbid conditions

## INTERVENTIONS AND PRACTICES CONSIDERED

### Diagnosis/Evaluation

1. History and physical examination
2. Screening for urinary tract infection (UTI)
  - Dipstick (nitrite and leukocyte esterase [LE])
  - Routine urinalysis (nitrite, leukocyte esterase, and microscopy)
3. Urine culture and susceptibilities

### Management/Treatment

1. Hospitalization, if indicated
2. Parenteral (inpatient) or oral (outpatient) antibiotics
3. Observation
4. Imaging evaluation for structural abnormalities for the urinary tract or bladder
  - Renal and bladder ultrasound (US)
  - Radionuclide cystogram (RNC)
  - X-ray voiding cystourethrogram (VCUG)
  - Renal cortical scan
5. Follow-up
  - Assessment of clinical response
  - Monitoring for recurrence
  - Consideration of prophylactic antibiotics for patients who will have imaging
6. Appropriate consultation and referral when necessary

## MAJOR OUTCOMES CONSIDERED

- Sensitivity and specificity of laboratory testing (urinalysis)
- Identification of anatomic abnormalities
- Infection recurrence
- Long-term renal damage

## METHODOLOGY

### METHODS USED TO COLLECT/SELECT EVIDENCE

## Searches of Electronic Databases

### **DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE**

To select evidence for critical appraisal by the group, the Medline, EmBase, and the Cochrane databases were searched for dates of January 1999 through October 2004 to generate an unrefined, "combined evidence" database using a search strategy focused on answering clinical questions relevant to urinary tract infection (UTI) and employing a combination of Boolean searching on human-indexed thesaurus terms (Medical Subject Heading [MeSH] headings using an OVID Medline interface) and "natural language" searching on words in the title, abstract, and indexing terms. The citations were reduced by eliminating duplicates, review articles, non-English articles, and adult articles. The resulting abstracts were reviewed by a methodologist to eliminate low-quality and irrelevant citations. During the course of the guideline development, additional clinical questions were generated and subjected to the search process.

#### **November 2006 Update**

A search using the above criteria was conducted for dates of October, 2004 through July, 2006. One relevant article was selected as potentially requiring changes to the 2005 version of the recommendations. The article was appraised and the Team approved the changes to the guideline (see the "Development Process" section in the original guideline document for details).

### **NUMBER OF SOURCE DOCUMENTS**

669 (2005 version) plus 148 (2006 update)

### **METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE**

Not stated

### **RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE**

Not applicable

### **METHODS USED TO ANALYZE THE EVIDENCE**

Review  
Review of Published Meta-Analyses

### **DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE**

Not stated

### **METHODS USED TO FORMULATE THE RECOMMENDATIONS**

Expert Consensus

## **DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS**

The recommendations contained in this document were formulated by an interdisciplinary working group which performed systematic and critical literature reviews, using the grading scale described below under "Type of Evidence Supporting the Recommendations," and examined current local practices.

Recommendations have been formulated by a consensus process directed by best evidence, patient and family preference, and clinical expertise. During formulation of these guidelines, the team members have remained cognizant of controversies and disagreements over the management of these patients. They have tried to resolve controversial issues by consensus where possible and, when not possible, to offer optional approaches to care in the form of information that includes best supporting evidence of efficacy for alternative choices.

## **RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS**

Not applicable

## **COST ANALYSIS**

A formal cost analysis was not performed and published cost analyses were not reviewed.

## **METHOD OF GUIDELINE VALIDATION**

Comparison with Guidelines from Other Groups  
External Peer Review  
Internal Peer Review

## **DESCRIPTION OF METHOD OF GUIDELINE VALIDATION**

The guidelines have been reviewed and approved by clinical experts not involved in the development process, distributed to senior management, and other parties as appropriate to their intended purposes.

# **RECOMMENDATIONS**

## **MAJOR RECOMMENDATIONS**

Each recommendation is followed by an evidence classification (A-X) identifying the type of supporting evidence. Definitions for the types of evidence are presented at the end of the "Major Recommendations" field.

### **Assessment and Diagnosis**

### **History and Physical Examination**

1. It is recommended that prompt evaluation for a diagnosis of urinary tract infection (UTI) be conducted. See the table below for clinical findings consistent with the diagnosis of a UTI.

**Table: Clinical Signs and Symptoms of UTI**

<b>Newborns</b>	<b>Infants and Preschoolers</b>	<b>School Age Children</b>
Jaundice		
Sepsis	Diarrhea	
Failure to thrive	Failure to thrive	
Vomiting	Vomiting	Vomiting
Fever	Fever	Fever
	Strong-smelling urine	Strong-smelling urine
	Abdominal or flank pain	Abdominal or flank pain
	New onset urinary incontinence	New onset urinary incontinence
	Dysuria (preschoolers)	Dysuria
	Urgency (preschoolers)	Urgency
		Frequency

Adapted from Todd, 1995 [S]

**Note:** Risk factors for UTI include:

- Male:
  - Uncircumcised <1 year
  - All <6 months
- Female, in general
  - Particularly <1 year
- Non-African-American race
- Fever  $\geq 39$  degrees Celsius

(Shaw et al., 1998 [C]; Craig et al., 1996 [C]; Hoberman et al., 1993 [C]; Bachur & Harper, "Reliability," 2001 [D]; Bachur & Harper, "Predictive model," 2001 [D])

Absence of high fever or other specific risk factors does not preclude the presence of UTI. Please refer to Appendices 2 and 3 of the original guideline document for further information on positive culture prevalence in patients with UTI symptoms and UTI prevalence and risk factors in children with fever.

### **Laboratory Studies**

2. It is recommended that urine samples be collected by catheter or suprapubic aspiration (if age appropriate), if a high quality clean catch mid-stream urine sample cannot be obtained (Hoberman et al., 1996 [C]; Weinberg & Gan, 1991 [D]).

**Note 1:** In a child with a low clinical suspicion of UTI, and in whom a catheterization would be both required for a culture and considered invasive by the clinician or the family, the option to perform a dipstick or routine urinalysis on a specimen collected by more convenient means may be considered, followed by catheterization if the urinalysis suggests a UTI (American Academy of Pediatrics [AAP], 1999 [S]). See the table below for likelihood ratios (LR) that a screening test for UTI will result in a positive urine culture.

**Note 2:** See Cincinnati Children's Hospital Medical Center (CCHMC) Nursing Policies, Procedures and Standards: "III-701 Urinary Catheterization/Bladder Irrigation" in the "Availability of Companion Documents" field.

**Table: Likelihood Ratios (LR) that a Screening Test for UTI will Result in a Positive Urine Culture**

Positive Test Result -- to Rule in UTI	Positive LR*
Nitrite	25
Microscopy, bacteria	5
Microscopy, leukocytes	4
Leukocyte esterase (LE)	5 (approx. range 2 to 18)
Gram stain	19

(Gorelick & Shaw, 1999 [M]; Armengol, Hendley, & Schlanger, 2001 [C])

\*LR scale: rules of thumb:

- LR >10 greatly increases diagnostic certainty
- LR = 1 test result is not helpful in diagnosis
- LR <0.2 greatly helps rule out condition

Likelihood ratios quantify the change in probability of definite UTI when a given test result is present in a specific clinical case and depend upon a starting estimate of probability. For more information, see Appendix 6 of the original guideline document for definition and use of LR.

3. It is recommended, in screening for UTI, to perform:
  - Dipstick (nitrite and LE) **or**
  - Routine urinalysis (nitrite, LE and microscopy)

**and**

- Urine culture and susceptibilities

(Gorelick & Shaw, 1999 [M]). See table above for LRs that a screening test for UTI will result in a positive urine culture.

**Note:** Gram stain is not commonly conducted in the Cincinnati pediatric community (Hoberman et al., 1996 [C]).

## Diagnosis

### General

Presumed UTI is diagnosed while urine culture results are pending in a child with abnormal laboratory studies and clinical findings consistent with the diagnosis of a UTI.

Definite UTI is diagnosed after obtaining a positive result for a urine culture in a child presenting with a clinical profile consistent with a UTI.

### Presumed UTI

4. It is recommended that while pending results of culture, any positive result from a dipstick or routine urinalysis, in the presence of clinical findings consistent with the diagnosis of a UTI, be considered consistent with a presumptive diagnosis of UTI (Gorelick & Shaw, 1999 [M]).

Any of the following study results defines a positive urinalysis (Gorelick & Shaw, 1999 [M]). See table above titled "LR that a Screening Test for UTI Will Result in a Positive Urine Culture" and table below.

- Positive nitrite screen
- Positive LE
- Positive microscopic exam
  - The definition of abnormal microscopic exam is dependent on patient or provider-specific determinants.

**Table: Microscopic Exam**

WBC/hpf* (spun)	LR
$\geq 5$	3.7 to 13.5
$\geq 10$	6.2 to 32.0

\*WBC/hpf: White blood cells/high-powered field

(Hoberman et al., 1993 [C]; Weinberg & Gan, 1991 [D])

### Definite UTI

5. It is recommended that a definite UTI be defined as a single organism cultured from a suprapubic aspirate (SPA), catheter specimen (cath), or clean catch midstream specimen (CCM) at the following concentrations. The higher the concentration of organisms, the more reliable the results; however, colony counts must be interpreted within the clinical context and lower colony counts may be significant, especially in a dilute urine
  - Suprapubic aspirate:  $>1,000$  colony forming units (cfu)/mL
  - Catheter specimen:  $>10,000$  cfu/mL
  - Clean catch midstream specimen:  $\geq 100,000$  cfu/mL

(Hansson et al., 1998 [C]; Rushton, 1997 [S, E])

## **Management**

### **Admission Criteria**

6. It is recommended that admission be primarily restricted to infants and children:

- Who require intravenous (IV) for fluids
- Who require IV antibiotics due to severe illness or due to lack of response to oral (PO) antibiotics

**Note:** A high quality, randomized controlled trial demonstrated that oral cefixime is a safe and effective treatment for children age 1 to 24 months with definite UTI. (Hoberman et al., 1999 [A])

- Who are 0 to 30 days of age
- Who are 31 to 60 days of age and identified as high-risk clinically or by laboratory data, or
- With whom the clinician or family is uncomfortable managing in an outpatient setting

(Local Expert Consensus, [E])

### **Medications**

7. It is recommended that a child with presumed UTI be empirically treated with antibiotics after obtaining an appropriate sample for culture. Prompt treatment with antibiotics reduces the severity of renal scarring (Benador et al., 1997 [C]; Winberg et al., 1982 [S, E]). See Appendix 7 and Appendix 8 of the original guideline document for summary of recommended doses for parenteral and oral antibiotics, respectively.

**Note:** Well-appearing children who are not febrile, and in whom dipstick or urinalysis results are equivocal can be considered for outpatient observation without starting antibiotic therapy until the subsequent clinical course and culture results are known. As long as uncertainty persists, this course of management assumes:

- Available reliable follow-up as needed and
- Healthcare provider(s) confident that caregiver will use appropriate observational and follow-up skills

(Local Expert Consensus, [E])

8. It is recommended, if the child is diagnosed with a definite UTI, that antibiotic therapy be continued for a minimum of 7 to 14 days (Keren & Chan, 2002 [M]). Culture and susceptibility results may indicate that a change of antibiotic is necessary. See Appendix 7 and Appendix 8 for summary of recommended doses for parenteral and oral antibiotics, respectively.

9. It is recommended, if the urine culture is negative, that antibiotics be discontinued (Local Expert Consensus [E]).

### Discharge Criteria

10. It is recommended that the hospitalized child be discharged as soon as:
- Afebrile for at least 12 hours
  - Taking adequate oral fluids
  - Pain controlled with oral medications
  - Home antibiotics tolerated (peripherally inserted central catheter [PICC] line or oral)
  - Parent confident in caring for child at home
  - Imaging studies are complete or arrangements have been made
  - Primary care provider(s) identified, notified, and agree(s) with discharge decision, and arrangements for appropriate follow-up have been made

(Local Expert Consensus, [E])

### Imaging

Imaging procedures available for children with UTI are described in the table below titled "Three Major Categories for Radiologic Evaluation of a Child Following a First Definite UTI": ultrasound (US), cystogram, and renal cortical scan. See also imaging algorithm, page 8 of the original guideline document and Appendix 10 (reflux grading system) of the original guideline document.

**Table. Three Major Categories for Radiologic Evaluation of a Child Following a First Definite UTI**

Category	Procedure	Purpose	Notes
<b>I. ULTRASOUND</b>	<b>Renal and bladder ultrasound (US)</b>	Demonstration of the anatomy of the kidneys, ureters, and bladder	<ul style="list-style-type: none"><li>• Not reliable to evaluate reflux</li><li>• Limited accuracy in evaluation of renal scarring or pyelonephritis</li></ul>
<b>II. CYSTOGRAM</b>	<b>Radionuclide Cystogram (RNC)</b>  Also called nuclear cystogram	Screening and grading vesicoureteral reflux (VUR)	<ul style="list-style-type: none"><li>• Suggested for girls only, if available</li><li>• Reproducibly low radiation dose</li><li>• The grading is similar to VCUG when performed by experienced radiologist</li><li>• Little anatomic detail</li></ul>
	<b>X-ray voiding cystourethrogram</b>	Screening and grading VUR	<ul style="list-style-type: none"><li>• Suggested for girls and all boys</li></ul>

Category	Procedure	Purpose	Notes
	<b>(VCUG)</b>  Also called fluoroscopic VCUG	Demonstration of anatomic detail of the male urethra, ureters (when reflux is present), and bladder	<ul style="list-style-type: none"> <li>Involves ionizing radiation</li> </ul>
<b>III. RENAL CORTICAL SCAN</b>	<b>Renal Cortical Scan</b>  Uses 99-Technetium-Dimercaptosuccinic Acid ( $^{99m}\text{TcDMSA}$ ) or $^{99m}\text{Tc}$ glucoheptonate  Also called scintigraphy or DMSA	Accurate for differentiating pyelonephritis from cystitis and assessing for renal scarring.	<ul style="list-style-type: none"> <li>Requires intravenous injection of radioisotope, with imaging about 2 hours later for about 45 minutes</li> <li>Sedation usually required in those &lt;3 years of age</li> </ul>
<b>General Comments:</b>			
<ul style="list-style-type: none"> <li>Both ultrasound and cystogram may be scheduled for the same visit. If the RNC is not available at the preferred location, a VCUG is acceptable.</li> <li>The diagnostic validity of VCUG for detection of VUR does not appear to be affected by performing the procedure during inpatient stay for treatment of UTI (Mahant, To, &amp; Friedman, 2001 [D]).</li> <li>When performing a cystogram on a child at risk for bacterial endocarditis due to a congenital heart defect, the American Heart Association recommends prophylactic antibiotic therapy.</li> </ul>			

A primary goal of imaging is to identify structural abnormalities of the urinary tract or bladder that may benefit from surgical or medical intervention. Decisions to perform imaging presume that the findings will sufficiently influence management to justify the burden of testing; for example, the discomfort of catheterization.

**Note 1:** The diagnostic validity of a cystogram for detection of VUR does not appear to be affected if the procedure is performed during an inpatient stay for treatment of UTI (Mahant, To, & Friedman, 2001 [D]).

**Note 2:** Routine cystogram and US following a first childhood UTI identifies a small proportion of children with associated treatable conditions. The approximate prevalences of VUR among girls age 0 to 18 years referred for VCUG evaluation after documented UTI (first or subsequent) are: Grade I, 7%; Grade II, 22%; Grade III, 6%; Grade IV, 1%; and Grade V, <1% (Bisset, Strife, & Dunbar, 1987 [D]). The prevalence of US-identified

anatomic abnormalities amenable to surgical correction following first UTI is approximately 1% (Zamir et al., 2004 [C]; Bisset, Strife, & Dunbar, 1987 [D]).

11. It is recommended, because careful long-term outcomes research has not been performed, that children in the following categories, with a first-time UTI, have a cystogram and US. See Table Above Titled "Three Major Categories For Radiologic Evaluation of a Child Following a First Definite UTI."
- All boys
  - Girls age <36 months (see Note 1 below)
  - Girls age 3 to 7 years (84 months) with fever  $\geq 38.5$  degrees C (101.3 degrees F)

(Gordon et al., 2003 [M]; Hoberman et al., 2003 [A]; Wennerstrom et al., "Renal function," 2000 [C]; Jodal, 2000 [S]; AAP 1999 [S]).

**Note 1:** Although an age break at three years is used, the appropriate age cutoff may depend, in part, on the girl's ability to verbalize dysuria symptoms and/or her status of toilet training (Local Expert Consensus [E]).

**Note 2:** A relatively small number of significant anatomic abnormalities will be missed if routine imaging after first UTI is not done (Zamir et al., 2004 [C]; Bisset, Strife, & Dunbar, 1987 [D]).

**Note 3:** Schedule the US and cystogram for the same date, with the cystogram to follow the US. If an RNC has been ordered, and if there are significant US abnormalities, the Radiology staff physician will ask to substitute a VCUG for the RNC at that appointment (Local Expert Consensus [E]).

**Note 4:** An optional imaging evaluation for children with febrile UTI, especially those over age three years, is to first perform US and renal cortical scan (see table above titled "Three Major Categories for Radiologic Evaluation of a Child Following a First Definite UTI"). This avoids bladder catheterization (part of the cystogram procedure) if the results of the scan are normal. However, if pyelonephritis or cortical scarring is found on the renal cortical scan, a cystogram is indicated (Local Expert Consensus [E]).

12. It is recommended, for children in the following categories, that observation without imaging be considered and that the family share in the decision of whether or not imaging be performed after the first UTI or delayed until after the second UTI, if one occurs:
- Girls  $\geq 3$  years of age without fever (temperature <38.5 degrees C)
  - All girls >7 years of age

(Local Expert Consensus, [E]).

Observation without imaging is defined as follow-up with dipstick or routine urinalysis when age-appropriate symptoms of UTI are observed.

**Note 1:** For imaging after first or second UTI, one option is to perform a cystogram and US. An alternative, for febrile UTI, is to perform a renal cortical scan and US (see Note 4 in the previous recommendation, and see table above titled "Three Major Categories for Radiologic Evaluation of a Child Following a First Definite UTI").

**Note 2:** Factors influencing choice of imaging option:

- Clinical symptoms and rate of resolution (see table above titled "Clinical Signs and Symptoms of UTI")
- Age (continuously decreasing risk of reflux over age 5 years)
- Abnormal relevant history (e.g., voiding dysfunction) or physical exam (e.g., sacral dimple)
- Family input: family understands the imaging procedures, that there is a small chance that an anatomic abnormality exists, and that close follow-up is needed for subsequent UTIs after which imaging may be performed
- Compliance: confidence that caregiver will use appropriate observational skills and follow-up
- African-Americans have lower risk of VUR and renal damage (West & Venugopal, 1993 [C]; Chand et al., 2003 [D]; Melhem & Harpen, 1997 [D]; Askari & Belman, 1982 [D])
- Availability of prenatal US images for review by radiologist (Ismaili et al., 2004 [C]; Chitty et al., 1991 [D]).

13. It is recommended that a renal cortical scan be considered if identification of acute pyelonephritis or renal scarring will affect management decisions in febrile UTI (Wennerstrom et al., "Ambulatory blood pressure," 2000 [C]; Wennerstrom et al., "Renal function," 2000 [C]; Majd & Rushton, 1992 [S, E]; Rushton et al., 1988 [F]). See table above titled "Three Major Categories for Radiologic Evaluation of a Child Following a First Definite UTI."

**Note:** The long-term significance of scarring identified by a renal cortical scan remains unclear. Factors to be considered are illness severity, grade of VUR, radiation exposure, and avoidance of bladder catheterization.

### Follow-up

14. It is not recommended that routine follow-up urine cultures be conducted during the initial course of inpatient or outpatient therapy.

**Note:** In a retrospective study, there were no positive results among follow-up urine cultures in 291 children while hospitalized with UTI. Thirty-two percent of these patients had fever longer than 48 hours (Currie et al., 2003 [D]).

15. It is recommended that follow-up assessment for expected clinical response occur after 48 to 72 hours of antimicrobial therapy. Culture and susceptibility results may indicate that a change of antibiotic is necessary. If expected clinical improvement is lacking, consider further evaluation which may include laboratory studies, imaging, and/or consultation with specialists (Local Expert Consensus, [E]).

16. It is recommended that families and clinicians maintain a high index of suspicion for recurrent UTI, and to obtain a dipstick, urinalysis, and/or culture for age-appropriate symptoms of UTI, including unexplained fever (Wennerstrom et al., "Ambulatory blood pressure," [C]; Local Expert Consensus, [E]). See Table above titled "Clinical Signs and Symptoms of UTI". Screening urine cultures are not necessary (Wettergren et al., 1990, [C]).

**Note:** Low rates of scarring, hypertension, and loss of renal function have been attributed to aggressive assessment of febrile illnesses and treatment of recurrent UTI (Wennerstrom et al., "Ambulatory blood pressure," [C]; Wennerstrom et al., "Renal function," 2000 [C]; Wennerstrom et al., "Primary and acquired," 2000 [C]).

17. It is recommended, for children who will have imaging, to consider the use of post-treatment antibiotic prophylaxis until radiologic evaluation results are known (Local Expert Consensus, [E]). See appendix 11 in the original guideline document for a summary of recommended doses of prophylactic antibiotics.

**Note:** Uncertainty exists regarding the effectiveness of prophylaxis in improving outcomes (Garin et al., 2006, [A]; Beetz, 2006 [S]) . See Appendix 12 in the original guideline document for further information on UTI prophylaxis.

### **Consults and Referrals**

18. It is recommended that consultation with a specialist in childhood renal disorder be considered:
- When uncertain about the management of a child with documented or suspected VUR, renal scarring, or structural abnormalities of the urinary tract; or
  - If a renal or bladder stone is identified

(Local Expert Consensus, [E]).

19. It is recommended that a consultation with Infectious Diseases be considered when there are questions about antibiotic selection or unusual organisms (Local Expert Consensus, [E]).

### **Definitions:**

### **Cincinnati Children's Hospital and Medical Center Grading Scale**

M: Meta-analysis  
A: Randomized controlled trial: large sample  
B: Randomized controlled trial: small sample  
C: Prospective trial or large case series  
D: Retrospective analysis  
O: Other evidence  
S: Review article

E: Expert opinion or consensus  
F: Basic laboratory research  
L: Legal requirement  
Q: Decision analysis  
X: No evidence

## **CLINICAL ALGORITHM(S)**

Algorithms are provided in the original guideline document for:

- The medical management of first urinary tract infection (UTI)
- Recommended imaging for first urinary tract infection

## **EVIDENCE SUPPORTING THE RECOMMENDATIONS**

### **REFERENCES SUPPORTING THE RECOMMENDATIONS**

[References open in a new window](#)

### **TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS**

The type of supporting evidence is identified and classified for each recommendation (see "Major Recommendations")

#### **Cincinnati Children's Hospital and Medical Center Grading Scale**

M: Meta-analysis  
A: Randomized controlled trial: large sample  
B: Randomized controlled trial: small sample  
C: Prospective trial or large case series  
D: Retrospective analysis  
O: Other evidence  
S: Review article  
E: Expert opinion or consensus  
F: Basic laboratory research  
L: Legal requirement  
Q: Decision analysis  
X: No evidence

## **BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS**

### **POTENTIAL BENEFITS**

- Improved use of appropriate diagnostic criteria
- Improved use of appropriate antibiotic therapy
- Improved use of appropriate imaging studies
- Avoidance of long-term medical problems
- Improved parental involvement in decision-making around the management of urinary tract infections

- Identification of the infants and children at most risk for long-term renal damage

## **POTENTIAL HARMS**

- Burden of imaging (e.g., discomfort of catheterization, radiation exposure) versus missed identification of treatable anatomic abnormalities
- Use of amoxicillin for treatment of the acute urinary tract infection may be limited due to increasing resistance.
- Ceftriaxone and sulfamethoxazole/trimethoprim should be used with caution in jaundiced infants.
- Limitations of radiologic imaging: ultrasound has limited accuracy in evaluation of renal scarring or pyelonephritis; radionuclide cystogram provides little anatomic detail; x-ray voiding cystourethrogram involves ionizing radiation; renal cortical scan requires intravenous injection of radioisotope, with imaging about 2 hours later for about 45 minutes)

## **QUALIFYING STATEMENTS**

### **QUALIFYING STATEMENTS**

- These recommendations result from review of literature and practices current at the time of their formulations. This guideline does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this guideline is voluntary. The physician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.
- The areas of uncertainty offering challenges in the management of UTI include accurate and prompt diagnosis, decisions regarding prophylactic therapy, and decisions regarding imaging procedures.
- Scientific uncertainty remains regarding many aspects of preventing adverse outcomes of urinary tract infections (UTIs). Unanswered questions include the effectiveness of long-term antibiotic use in preventing UTI recurrence or renal scarring, the ability to identify which at-risk patients would most benefit from this intervention, and whether it is safe to wait for a second UTI before intervening with antibacterial prophylaxis. Therefore, the role of prophylaxis is evolving and may vary with the age of the child, the severity of the initial illness, and the results of any imaging studies.

## **IMPLEMENTATION OF THE GUIDELINE**

### **DESCRIPTION OF IMPLEMENTATION STRATEGY**

Tools to assist in the effective dissemination and implementation of the guideline may be available online at <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/default.htm> . Experience with the implementation of earlier publications of this guideline has provided learnings which have been incorporated into this revision.

## IMPLEMENTATION TOOLS

Chart Documentation/Checklists/Forms  
Clinical Algorithm  
Foreign Language Translations  
Patient Resources  
Quick Reference Guides/Physician Guides

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better

### IOM DOMAIN

Effectiveness  
Patient-centeredness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Cincinnati Children's Hospital Medical Center. Evidence-based care guideline for medical management of first urinary tract infection in children 12 years of age or less. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2006 Nov. 23 p. [70 references]

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

1999 Mar 28 (revised 2006 Nov)

### GUIDELINE DEVELOPER(S)

Cincinnati Children's Hospital Medical Center - Hospital/Medical Center

### SOURCE(S) OF FUNDING

Cincinnati Children's Hospital Medical Center

### GUIDELINE COMMITTEE

First Urinary Tract Infection Team 2004-2005

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## **FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST**

This guideline was developed without external funding. All Team Members and Clinical Effectiveness support staff listed have declared whether they have any conflict of interest and none were identified.

## **GUIDELINE STATUS**

This is the current release of the guideline.

This guideline updates a previous version: Cincinnati Children's Hospital Medical Center. Evidence based clinical practice guideline for medical management of first time acute urinary tract infection in children 12 years of age or less. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2005 Apr 18. 20 p.

## **GUIDELINE AVAILABILITY**

Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).

For information regarding the full-text guideline, print copies, or evidence-based practice support services contact the Children's Hospital Medical Center Health Policy and Clinical Effectiveness Department at [HPCEInfo@chmcc.org](mailto:HPCEInfo@chmcc.org).

## **AVAILABILITY OF COMPANION DOCUMENTS**

The following are available:

- Urinary tract infection (UTI). Guideline highlights. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2006. 1 p. Electronic copies: Available in Portable Document Format (PDF) from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Emergency Department (ED) algorithm for medical management of uncomplicated urinary tract infection in children age 12 or less. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2005. 2 p. Electronic copies: Available in Portable Document Format (PDF) from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Order Sets, including:
  - Explanation of Front and Back Page Orders
  - First Urinary Tract Infection (UTI) Admission Order Set - Front Page Orders Only
  - First Urinary Tract Infection (UTI) Admission Order Set - Full Set

Electronic copies: Available in Portable Document Format (PDF) from the [Cincinnati Children's Hospital Medical Center Web site](#).

## **PATIENT RESOURCES**

The following Health Topics are available:

- Temperature taking. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2005 Oct. Electronic copies: Available in English and Spanish from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Vesicoureteral reflux (VUR). Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2006 Nov. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Urine culture: adult assisting a female child. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2006 Sep. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Urine culture: adult assisting a male child. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2006 Aug. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Kidney ultrasound. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2005 Nov. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).
- Voiding cystourethrogram. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2005 Dec. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).

- Nuclear cystogram. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2005 Dec. Electronic copies: Available from the [Cincinnati Children's Hospital Medical Center Web site](#).

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## NGC STATUS

This summary was completed by ECRI on September 20, 1999. The information was verified by the guideline developer as of November 15, 1999. This NGC summary was updated by ECRI on July 11, 2005. The updated information was verified by the guideline developer on August 11, 2005. This NGC summary was updated by ECRI on December 26, 2006. The updated information was verified by the guideline developer on January 17, 2007. This summary was updated by ECRI Institute on October 3, 2007 following the U.S. Food and Drug Administration (FDA) advisory on Rocephin (ceftriaxone sodium). This summary was updated by ECRI Institute on July 28, 2008 following the U.S. Food and Drug Administration advisory on fluoroquinolone antimicrobial drugs.

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